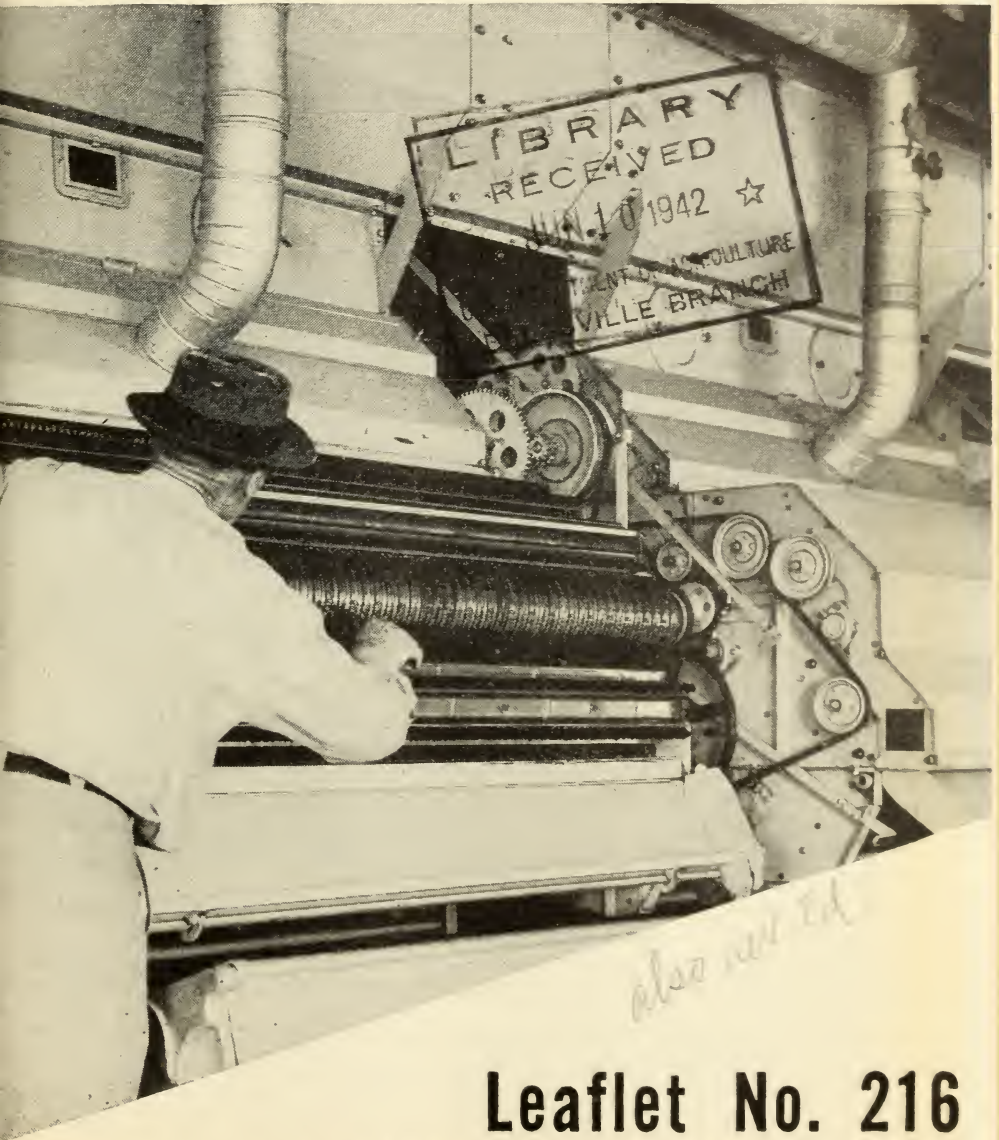


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# Cotton-Gin Maintenance



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**U. S. DEPARTMENT OF AGRICULTURE**

# COTTON-GIN MAINTENANCE

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Cotton-gin repairs are in the interest of both cotton growers and ginnermen, since they are important in economy of operation and in preserving the inherent quality of the seed cotton and frequently afford opportunities to modernize the ginning establishment.

Better quality of the ginned products, increased capacity, improved performance of the ginning outfit, and lower cost of operation are among the benefits resulting from the prompt repair and adequate maintenance of the ginning equipment. Thus, for example, losses in the monetary value of the ginned lint from brushes in poor condition have averaged from 80 cents on short-staple to as much as \$1.50 on damp long-staple cottons. Replacing worn brushes has decreased ginning time 7 to 10 percent. Losses from air-blast nozzles improperly adjusted have averaged as much as \$1 a bale on long-staple cotton ginned in a moist condition. Losses to the farmer from ginning with gin saws in poor condition have averaged \$2 a bale with long-staple cottons and at the same time ginning was 25 percent slower than it would have been if the saws had been in good condition.

An overhaul of gin saws was needed in more than one-fourth of the 500 representative gins surveyed by the laboratory in 1940. When making these needed repairs is a good time to make changes necessary to speed up slow saw cylinders. This can be done to advantage in the older gins operating their saws at or below 500 revolutions per minute and which constitute approximately 45 percent of the gins in the Cotton Belt. Similarly, repair and maintenance of conveyors and distributors in many cases may lead to steps for providing pure seed-handling systems. At present, only a small percentage of all cotton gins in the United States are so equipped. Check-ups on shafting, bearings, and drives opened the way to brush repairs needed in over one-third of the gins and rib repairs in almost one-third of the gins inspected.

In repairing gins, a good plan is to systematically check all important elements of ginning along the route over which the cotton passes. This leaflet may be used as a general guide for repairing and modernizing the machinery.

## Checking Pneumatic Cotton-Handling Equipment

For delivering seed cotton to storage bins, well planned piping and Rembert-type fans utilize only 10 horsepower from either a motor or internal-combustion engine. Suction piping to such a fan should not be larger than 11½ or 12 inches in diameter, with a round-nose telescoping pipe for effective introduction of seed cotton into the air line, and the discharge piping from the fan should be 1 inch smaller in diameter. Overhead swing pipes from central pivots or series of outlets give delivery to a maximum number of bins with minimum valving. For removal of seed cotton from storage, the suction piping may be either overhead or under the floor; but in any case, it should be kept in first-class condition and all unused openings made airtight with good covers.

Economical pneumatic cotton-handling equipment comprises relatively small pipe, simplicity of layout, and use of the Rembert-type fan or the improved cone-type Rembert fan developed by the United

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States Cotton Ginning Laboratory, rather than old form fan and separator devices. The entire system should be as nearly airtight as possible.<sup>1</sup> These fans may be combined with drying systems for delivery of seed cotton to the gins by various methods, with or without suction separators; or installed to use old separators of different kinds by conversion from suction to blow-box units, retaining the vacuum wheel, if any, to act as dust seals. For conventional separator systems, suction and seed-blow piping in three- or four-stand outfits should not exceed about 10½ inches in diameter.

To save power and simplify the ginning equipment, belt distributors are now being frequently replaced with screw-conveyor distributors. In the repair of existing belt distributors the alinement of the distributor box is very important to prevent fires and undue wear of the pulleys, and special care is needed to prevent distributor-belt spikes from becoming loose and dropping off into the machinery.

### Inspecting Drying, Cleaning, and Feeding Equipment

On all overhead machinery it is important to keep supports and fastenings tight. The general condition of screens, as well as the clearance between them and the cylinders should be observed. When they are too close to the cylinders, the seed cotton is likely to be machined. If too far away, they may produce roping and rolling of the cotton. With green, damp, or wet cotton, introducing hot air into overhead cleaners makes for better cleaning and fewer repairs.

Extractor saws may get bent and broken by foreign matter, such as rocks and sticks. Each periodic inspection is a good time to straighten and realine the extractor teeth and put them into good shape. (See the illustration on the cover page.) All of the mechanism governing the rates of feed of seed cotton, extractor feeders, and other feeding equipment should also be inspected and kept in repair. Bearings need periodical repacking and testing for wear. Trash conveyors from feeders should be shortened and simplified as much as possible. Driers require inspections to keep their radiators and cotton passages in good condition with smooth surfaces, tight joints, and freedom from chokage in screens.

### Putting Gin Stands in Shape

Freedom from vibration and end play in the rib assemblies, saw cylinders, and other moving parts of cotton gins is of utmost importance in preventing undue wear and damage. Replacement by self-alining ball bearings of older style flat or ring-oiling ones is a big step toward freedom from trouble with lubrication and operation. If gin stands are of semiwood construction it is desirable that all braces be carefully inspected and tightened, and that all wooden parts subject to wear, such as wind boards, dividing boards, and mote boards, be covered with metal to preserve their correct shapes and settings (fig. 1).

In old gin stands a curved metal hood, easily removable, is a desirable cover for brush gins and can be put on to prevent accumulation of fine lint and fly in the spaces over the brushes. Picker-roller drives also may need attention and belt replacements from time to time. Spikes on the picker rollers should be straight and kept at the

<sup>1</sup> Stedronsky, Victor L., Baggette, Thomas L., and Johnson, Arvid J. REDUCING POWER WASTE IN OPERATING COTTON GINS. U. S. Dept. Agr. Cir. 601, 20 pp., illus. 1941.

proper angle. Gin-flue connections leading to the lint flue are often sources of trouble when not tightly attached to the stand or when they contain broken or rough projections upon which "tags" of lint may build up into large wads before being torn loose. Repainting gin stands and keeping the monograms on their fronts neat in appearance make the gin more attractive to customers.

### Modernizing Gin Breasts

Loose-roll ginning should be the objective in repairing and modernizing old gin breasts. Obsolete types of huller ribs can be replaced with the latest forms of huller ribs to help the ginning. Ginning ribs, when sufficiently worn to allow seeds to pass through the saw slots, should be repaired only in well-equipped shops or replaced. Rib rails require replacement when defective or so full of screw holes from previous repairs that they no longer maintain a rigid assembly. It is important to have seed-board fingers in good condition and of no greater length than necessary for proper cleaning of seed. The lambrequins or control levers for the seed boards should work freely and correspond to the actual position of the fingers so that during the ginning the operator may know definitely the position of the seed boards. Although replacement of plain gin breasts with huller breasts is not so advantageous in extracting and cleaning as the replacement of drum feeders by extractor-cleaner feeders, nevertheless, the installation of new huller fronts is usually a good investment in modernizing gins.

### Necessary Attention to Gin Saws <sup>2</sup>

Light and frequent sharpening of saws is better than occasional heavy sharpening to maintain them at highest efficiency. When wear and repeated sharpenings have reduced the diameters more than one-sixteenth of an inch below the original factory diameters, it usually pays to install new saws.

Surveys of about 500 commercial gins in 1940 showed a direct relationship between seed-roll density and saw condition and diameter, as well as between ginning capacity and each of these two elements of the gin saws. The ginning time ranged, on the average, from about 1 hour per bale per gin stand in the gins having good saws to 1½ hours for those operating with poor saws. With reference to saw-diameter reduction, ginning time per bale ranged from 65 minutes for gins with 12-inch saws to 80 minutes for gin stands having saws with diameters of 11<sup>7</sup>/<sub>16</sub> inches and below, confirming data obtained in controlled experiments at the United States Cotton Ginning Laboratory.

Modern gins are being stepped up in saw speeds to 600 revolutions per minute or more, to provide looser seed rolls, smoother ginning, and better capacity and turn-out. In doing this with brush gins, it is desirable to retain the brush and feeder speeds at their former rates and make only those changes which directly affect the saw cylinders, as well as the picker roller if its speed would otherwise be increased more than 150 revolutions per minute. The pitch of the saws should be checked frequently to insure the entrance of the point of the tooth in the rib slot either slightly ahead of the leading edge or at least so that the leading edge of the tooth will be parallel to the ribs.

The commercial-gin surveys brought out the fact that loose seed rolls, which provide smoother ginning than dense seed rolls, were

<sup>2</sup> Bennett, Charles A., and Gerdes, Francis L. CARE AND MAINTENANCE OF COTTON-GIN SAWS AND RIBS. U. S. Dept. Agr. Cir. 393, 20 pp., illus. 1936.



employed proportionately more with high than low saw speeds and that the ginning time ranged, on the average, from 63 minutes for the high-speed gins to 83 minutes per bale per gin stand for the low-

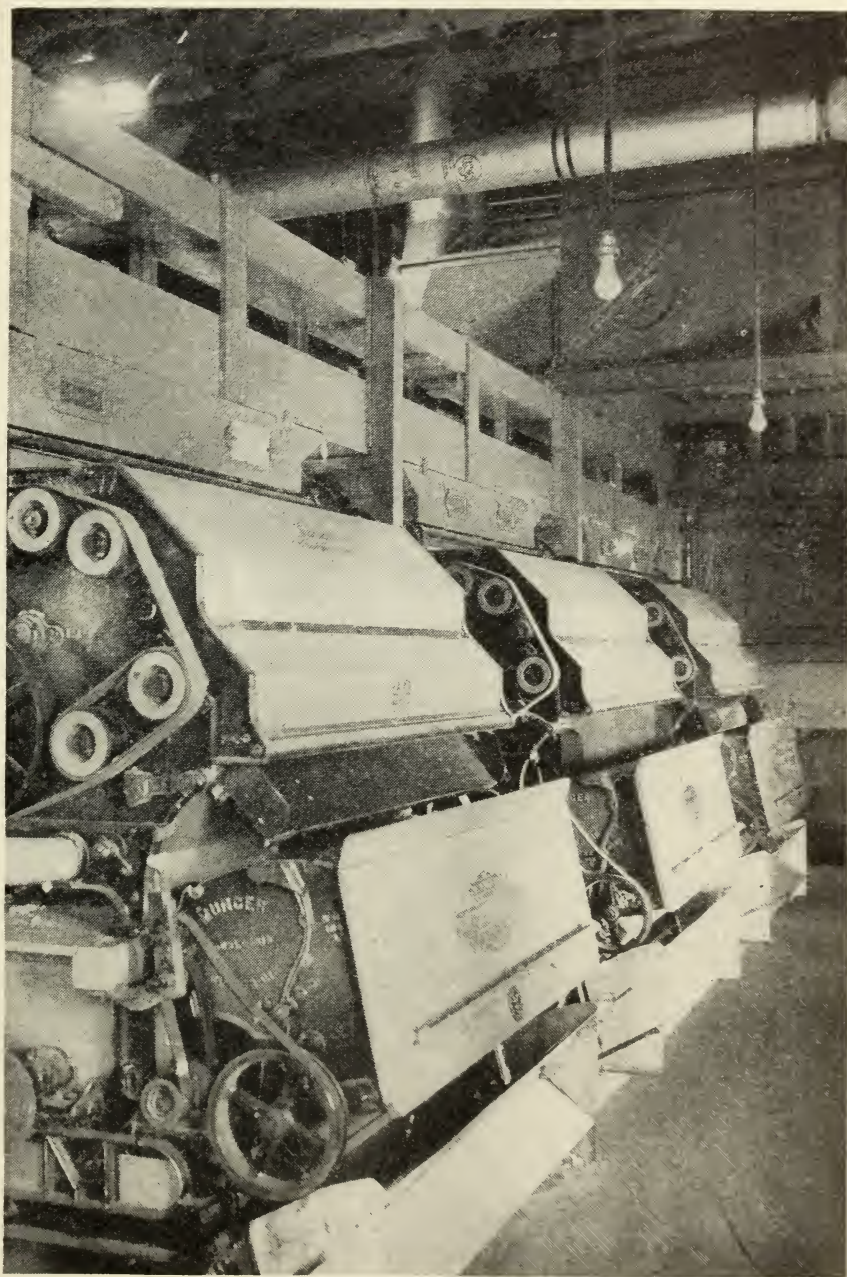


FIGURE 1.— A modernized cotton gin in which a tower drier has been installed and extractor-cleaner feeders have replaced plain drum feeders over gin stands which have been equipped with ball bearings, high-speed improved saws, new brushes, metal interior parts, and new huller ribs.

speed gins. These observations are in line with laboratory tests. A modernized gin, having saws operating at 600 revolutions per minute and a new brush and cleaner-extractor feeder properly operated, had 30 percent greater capacity, more than 1 percent better turnout, and higher quality than the twin gin of the same design not rebuilt, which had a plain drum feeder, and operated with saws in poor condition at 400 revolutions per minute and with a brush that had not been reconditioned. When the two gins were operated at the same capacity, the seed roll of the unmodernized gin tightened up, and caused rougher ginning preparation than that of the modernized gin.

### Testing Lint-Doffing Systems

Care and repair of brush- and air-blast doffing systems cannot be overemphasized.<sup>3</sup> Improved construction of gin brushes with metal clips and covers instead of old-type wire-bound construction should be considered for new brush assemblies where complete replacement is necessary. Uniform weight and balanced brush sticks are also available for refilling old cylinders but the balancing might better be done at a well-equipped shop. Air-blast nozzles must have uniformity of throat, proper position, and freedom from unbroken nozzle partitions which would otherwise cause the nozzle lips to flare out under pressure.

### Ginning Bearings, Belts, and Pulleys

Efficient operation with minimum number of shut-downs depends largely upon how the gin is installed. Ball or roller bearings with felt seals require less attention and give better service than other types of bearings. Balanced steel or cast pulleys generally run more smoothly and with less danger at high speeds than laminated wooden ones; and ample-width belts on proper centers with safe splicings will give longer trouble-free service than belts of inadequate size or belts incorrectly installed. Too much belt dressing gradually builds up lumps on belt and pulley surfaces, makes for belt throw-offs, and may break the belt lacing.

Where adequate centers for flat belts are not possible in the gin, vee belts are desirable. Flat-faced, metal pulleys, especially for fan drives, may be used on the line shafts with vee belts if the smaller driven pulley is provided with grooves. The range of stock lengths of vee belts is such that most center distances between shafting and fan can be handled. Right-angle drives and quarter turns with vee belts enable a ginner to simplify many drives on short centers.

### Providing Pure-Seed Handling Equipment

In two-story gins, hinged bottoms on seed-screw conveyor troughs permit quick clean-out and delivery of pure seed to sackers or vacuum wheels. In either single or two-story outfits, other suitable methods are to install self-cleaning vacuum wheels and air pipe beneath the gin stands, or a 4- or 6-inch self-cleaning belt directly in front of the stands so that it may convey seed to sacking or blowing devices. More recent among various types of seed-blow systems, is the high-pressure small-pipe method. (Fig. 2.)

Remodeling the gin for keeping seed pure is an improvement which the farmer customer usually appreciates. At many gins this improvement might be combined with equipment for delinting

<sup>3</sup> Stedronsky, Victor L., and Johnson, Arvid J. CARE AND REPAIR OF COTTON-GIN BRUSHES. U. S. Dept. Agr. Cir. 467, 14 pp., illus. 1938.

Johnson, Arvid J., and Baggette, Thomas L. AIR-BLAST GIN PERFORMANCE AND MAINTENANCE. U. S. Dept. Agr. Cir. 510, 18 pp., illus. 1938.



and chemically treating seed, a service profitable to ginner and farmer alike. About two tons of seed can usually be delinted per day with a 106-saw delinter of the type frequently available as a

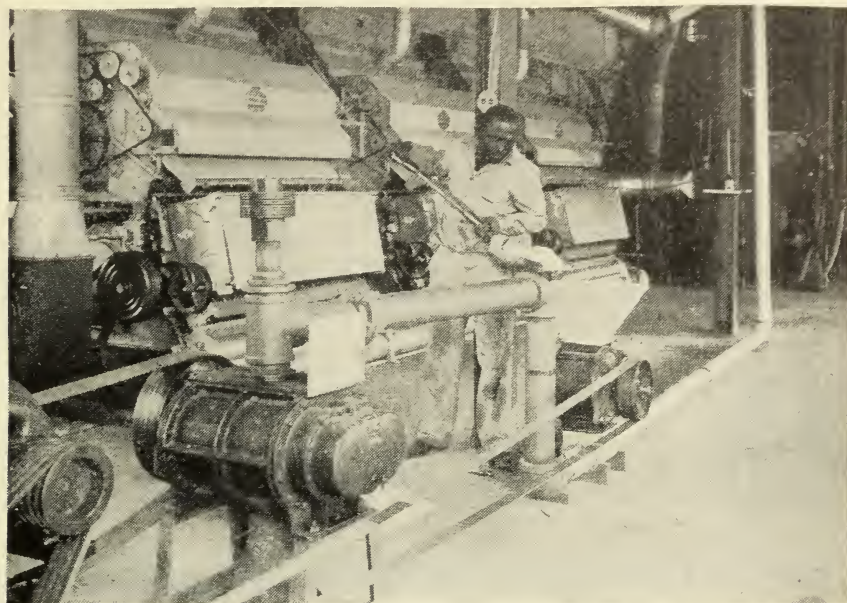


FIGURE 2.—Demonstration set-up of high-pressure small-pipe economy seed-delivering system using a rotary blower and approximately 200 feet of 4-inch pipe (inside diameter).

discarded machine from modernized oil mills. About 10 horsepower per delinter stand is required to perform this work, and the usual charge for delinting and chemically treating is approximately 35 cents per hundred pounds of delinted and treated planting seed.

### Inspecting Lint Handling Systems

Repair and maintenance of gin flues, lint flue, condenser, and tramper are essential for uniform handling and packaging of the ginned cotton. If the lint stream does not spread uniformly over the condenser drum, a deflector inserted in the lint flue is the conventional means for improvement. Where condensers discharge usable lint through their dust flues, the sealing rubbers and drum screens should be attended to. Where there is backlash and the condenser drum appears to be of ample size, a speeding up of the drum may be the solution, but does not necessarily carry with it an attendant increase in the speed of kicker wheel or tramper.

### Checking Kicker, Tramper, and Press

In condenser troubles it is advisable to consult the manufacturer before undertaking extensive changes or repairs. Condenser drum speeds are usually about eight turns per minute, while the kickers generally make a like number of turns to each complete movement of the tramper. If the kicker wheel turns too fast it may rope the cotton and throw it to the front of the box and thereby produce "rolling" bales; or, if it goes too slowly, it may produce a rolling bale by failure to spread the cotton uniformly in the box. Such troubles can be

remedied by adjusting the speed of the kicker. Down-draft or side-draft condensers should be fitted with dust houses having free vents so that "pin" and "pepper" trash will not be spread around the neighborhood.

Wooden press boxes may be reworked with steel bindings and structural-steel reinforcing so that their life and utility are extended. Ram packings of modern type are more satisfactory than old style. Modern packing allows the use of petroleum oil for the hydraulic fluid, which keeps the plunger in polished condition during the idle season. The best way to maintain the hydraulic pump in good condition is to see that it is properly shielded or cased in from dust and grit. In some instances it is possible to eliminate a troublesome belt shift on gin pumps and substitute a continuous drive by short-center vee belts from the stub or line shaft. When this is done an oversize, recirculating line should be returned from the press valve to the pump sump so that the load will be very light when the pump is idling.

### Maintaining Gin Building

Nothing influences the public more favorably in its first contact with a cotton gin than a neat, trim, and clean appearance of the buildings and premises. Repairing, painting, and fireproofing to achieve this are profitable and desirable. Replacement of deteriorated or rotten wooden siding with galvanized iron on gin buildings which have good frames improves their appearance and aids in fireproofing them at the same time. Interior sheathing of corrugated or V-crimp sheet metal is preferable to wooden or composition sheathing. Using wire-reinforced glass in windows reduces breakage of panes and necessity for frequent replacement. For safety, lightweight steel stairs should replace wooden ones wherever possible. Tread spaces on stairs are sometimes filled with cement so that any wear can be readily repaired at slight cost.

### Taking Care of the Gin During the Idle Season <sup>4</sup>

It is desirable to clean the gin at the beginning of the season, keep it clean during operation, and leave it clean when the last bale has been ginned. Remove belts and roll up and store them in a dry, safe place; remove brushes from the stands and hang them up where they will be protected from dampness, vermin and rodents; and coat saws with a protective lubricant such as a mixture of lard and filtered crankcase oil or some special rustproofing combination. Seed rolls should be dumped and the ribs coated with a rust-resistant lubricant. Driers, separators, distributors, and feeders, with their trash screws and dirt receptacles, stay in better condition if cleaned out and then protected during idleness. Surplus deposits of grease and oil around the gin, together with any festoons of "fly" and accumulations of combustible trash are all dangerous as well as evidence of carelessness. Clean premises reduce the hazard of fires from spontaneous combustion; locked premises will prevent intrusion by tramps and others, and metal sheathing on buildings will prevent removal of siding and equipment.

<sup>4</sup> Bennett, Charles A., Baggette, T. L., and Gerdes, F. L. MODERNIZING COTTON GINS, U. S. Dept. Agr. Farmers' Bul. 1802, 52 pp., illus. 1938.





